

## **ABSTRACT**

### **Detection of Explosives, Nerve Agents, and Other Illicit Substances by Zero-Energy Electron Attachment**

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The Reversal Electron Attachment Detection (READ) method, developed at JPL/Caltech, has been used to detect a variety of substances which have electron-attachment resonances at low and intermediate electron energies. In the case of zero-energy resonances, the cross section (hence attachment probability and instrument sensitivity) is mediated by the so-called s-wave phenomenon, in which the cross sections varies as the inverse of the electron velocity. Hence this is, in the limit of zero electron energy or velocity, one of the rare cases in atomic and molecular physics where one carries out detection via infinite cross sections!

The READ technique and its ability to generate electrons of zero and near-zero velocity will be described. Its use will be given in the detection of TNT, RDX, PETN, underwater unexploded ordnance, nerve and blister agents, and drugs. READ is capable of detecting of not only substances which attach low-energy electrons, but substances which attach higher-energy electrons as well. This anticipates new-type explosives for which conventional methods (IMS, ozonization, etc.) may be blind. Since it is a mass-spectrometric based technique, READ does not depend upon the presence of nitro groups in the target molecule.